Mehner, and used the same instrument, the essential parts of which consist in a device for marking off the standard time by the interval between two electric clicks, and for measuring the time between the last of these clicks and the stoppage of the apparatus, the latter being the time that the subject regards as equal to the first interval. Vierordt had found that small intervals are over-estimated, large ones under-estimated, an indifference point (where the estimate is correct) intervening. Estel found that at the multiples of the time at which this indifference point occurred there were likewise maxima of accuracy of judgment; he also concluded that Weber's law was not applicable to the time sense. Mehner's results are, that these maxima of accuracy occur only at the *odd* multiples of the indifference time (.71 sec.), the minima of accuracy occurring at the even multiples, up to about 11.4 sec. Furthermore, that intervals up to .7 sec. were exaggerated; intervals from .7 sec. to 5 sec. were under-estimated, and larger intervals again exaggerated. The author subjects these results to a rigorous criticism, the outcome of which is that a harmony in the results can be brought about only by not working the results for more than they are worth, and by taking into account the method, the unavoidable individual differences, and the rough and unusual sense exercise that is employed.

His own results are as follows: The standard times in the first series were the multiples of .7 (in the main) up to 15 sec.; and 100 observations on each time were made. He finds that points of greatest accuracy are at 2.8, 7.8, 9.3, 12 and 14.2 secs., and of minimum accuracy at 5, 8.5, 10, 12.8 and 15 sec. This does not agree with the periodicity of Mehner, but shows two groups of relative indifference points, each rising by an interval of about 5 sec. (2.8, 7.8, 12), (9.3, 14.2). The result of the second and more extended series is that the difference between the points of greatest accuracy is quite regularly 1.25 sec., with the exception that at .8 sec. there is a point not thus included. The law for the points of least accuracy cannot be traced. If we take into account that all the judgments are too long because they include parts of a reaction time and deduct $\frac{1}{10}$ of a sec. on this score, all the intervals (excepting that at .8) are under-estimated. The general conclusion supports Vierordt and opposes Mehner. Regarding Weber's law the author concludes that while decided deviations from this law occur (some of which can be explained), yet there is a strong tendency to follow the law as closely as the nature of the experiments would lead one to expect.

It will be seen that while this paper forms a real contribution to our knowledge of the time sense, it by no means places this topic in the clear light in which it should stand to gain recognition as a branch of accurate science. J. J.

Beiträge zur Theorie der sinnlichen Aufmerksamkeit und der activen Apperception. Von N. LANGE. Philos. Studien, Bd. 4, Heft 7.

Attention strengthens sensations, so that even very weak ones may eclipse in consciousness those objectively far stronger. But for this specific power, present sensations would expel concepts, memory, etc., because the former are more intense. Attention, however, is no extraneous power. It is a name for the process of reinforcing one set of impressions by another set. In attention the will does not work directly on concepts. The will must not be divided into motive and

apperceptive will, and it cannot inhibit concepts. This whole problem has grown in importance with the decline of the English theory of association, and the latter is due to the neglect of the phenomena of active apperception. Very feeble sensations strongly attended to alternately vanish and grow intense. The duration of the periodic wave of attention can thus be measured. Helmholtz had noticed this vacillation of unusual optical impressions in experiments with Masson's discs, and Urbantschitsch had noticed a similar phenomenon in the ticking of a watch not due to objective variation or to peripheral organs, but to central changes in attention. It is observed in cases of perforated tympanum, and so cannot be due to periodic tension of entotic muscles. That this is not due to the fatigue of the acoustic nerve, as Urbantschitsch thought, is shown by the fact that when the phenomenon is observed for both optical and acoustic sensations simultaneously, the two periodicities of the two series of sensations do not coincide, but are separated by a fixed interval. Thus the cause cannot lie in independent peripheral organs, but must lie in a common centre. Lange was able to register these vacillations of intensity chronoscopically, not only for one, but for two kinds of sensation simultaneously. These periods are longest for sound (3.5 to 4 seconds), next longest for light (3 to 3.4 seconds), and shortest for faint electrical stimuli (2.5 to 2.6 seconds). The average variation was less than one fourth of the entire period.

De la Répartition du Sang circulant dans l'Encéphale. Expériences faites au laboratoire de physiologie de l'Université de Bruxelles. E. SPEHL. L'Encéphale, 1887, Vol. I.

The old theory that the brain was congested in sleep was first effectively combatted by Durham in 1860. Since then the anaemic state of the cortex has been experimentally proven in four ways: 1. By experimentation on animals by Claude Bernard, Weir Mitchell, and others; 2. A little later, by observations of the movements of contraction and expansion in patients who have lost a part of the skull; 3. By observations on the same class of patients by the more precise graphic method—last and chiefest by Mosso; 4. A method preferred by Hammond, of ophthalmoscopic observation of the retina as reflecting the vascular state of the brain. The method of Spehl was to apply about the neck of a rabbit an apparatus by which all connection between the head and trunk could be instantly arrested and decapitation be then carefully made. Five animals in the normal condition were subjected to this treatment, and the weight of the whole body and that of the quantity of blood in the head and trunk carefully determined. Five more were treated then in the same way in a state of sleep induced by chloral, and the results compared. The average proportion of blood in the head in the latter series had sunk from one eighth to more than one eleventh, confirming thus the general conclusion that in sleep the brain as a whole is anaemic. The mode of experiment does not of course admit of discrimination between the quantity of blood in the head and in the brain only, and the inference from sleep produced by normal sleep to the hypnotism of chloral is obviously only highly probable. The author suggests, in conclusion, that the differences of opinion that have prevailed may be due to the active parts of the brain being congested and inactive parts anaemic at the same time.